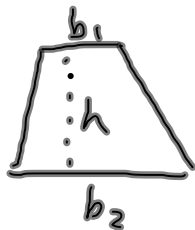


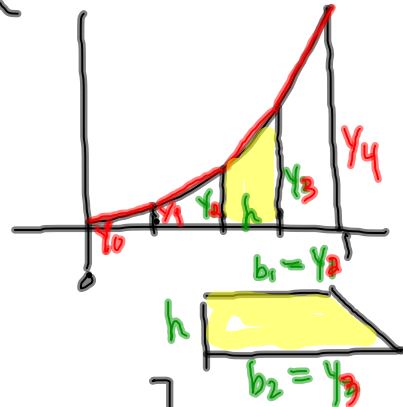
## 5.5 trapezoidal rule

area of a trapezoid



$$\text{area} = \frac{1}{2}(b_1 + b_2)h$$

$$\text{approx } \int_0^1 x^2 dx$$

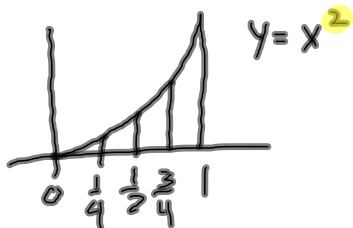


$$T = \frac{1}{2}(y_0 + y_1)h + \frac{1}{2}(y_1 + y_2)h + \frac{1}{2}(y_2 + y_3)h + \frac{1}{2}(y_3 + y_4)h$$

$$T = \frac{h}{2} [y_0 + y_1 + y_1 + y_2 + y_2 + y_3 + y_3 + y_4]$$

$$T = \frac{h}{2} [y_0 + 2y_1 + 2y_2 + 2y_3 + y_4] \quad h = \frac{1-0}{4} = \frac{1}{4}$$

Nov 30-11:44 AM



$$\text{approx. } \int_0^1 x^2 dx \text{ with Trap}(4)$$

$$h = \frac{1}{4}$$

$$T = \frac{1/4}{2} \left[ 0^2 + 2\left(\frac{1}{4}\right)^2 + 2\left(\frac{1}{2}\right)^2 + 2\left(\frac{3}{4}\right)^2 + 1^2 \right]$$

$$= \frac{1}{8} \left[ \frac{2}{16} + \frac{2}{4} + 2 \cdot \frac{9}{16} + 1 \right] = \frac{11}{32}$$

general Trapezoidal

formula:

a = left b = right

n = # traps

$$T = \frac{h}{2} [y_0 + 2y_1 + 2y_2 + \dots + 2y_{n-1} + y_n]$$

$$h = \frac{b-a}{n}$$

only works if traps all have same widths. (x's are evenly spaced)

Nov 30-11:57 AM

Ex 2: data

Time	N	1	2	3	4	5	...	11	M
Temp	63	65	66	68	70	69	...	58	55

estimate ave Temp using trap.

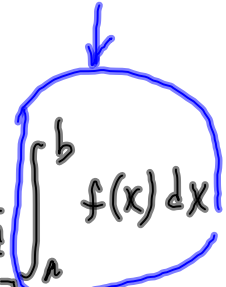
$$\text{Trap} \approx \int_a^b f(x) dx$$

$$\text{ave value of } f(x) = \frac{1}{b-a} \int_a^b f(x) dx$$

$$\frac{1}{12-0} \cdot \frac{1}{2} [63 + 2 \cdot 65 + 2 \cdot 66 + \dots + 2 \cdot 58 + 55] = 65.1667$$

okay to use shortcut because x's are evenly spaced.

approx with trap



Nov 30-12:12 PM

$$\text{estimate } \int_1^2 \frac{\sin x}{x} dx \approx .6593 \text{ with Trap}(100)$$

$$\text{define } f(x) = \frac{\sin(x)}{x}$$

shortcut?

$$(lram(1,2,100) + rram(1,2,100)) / 2.0$$

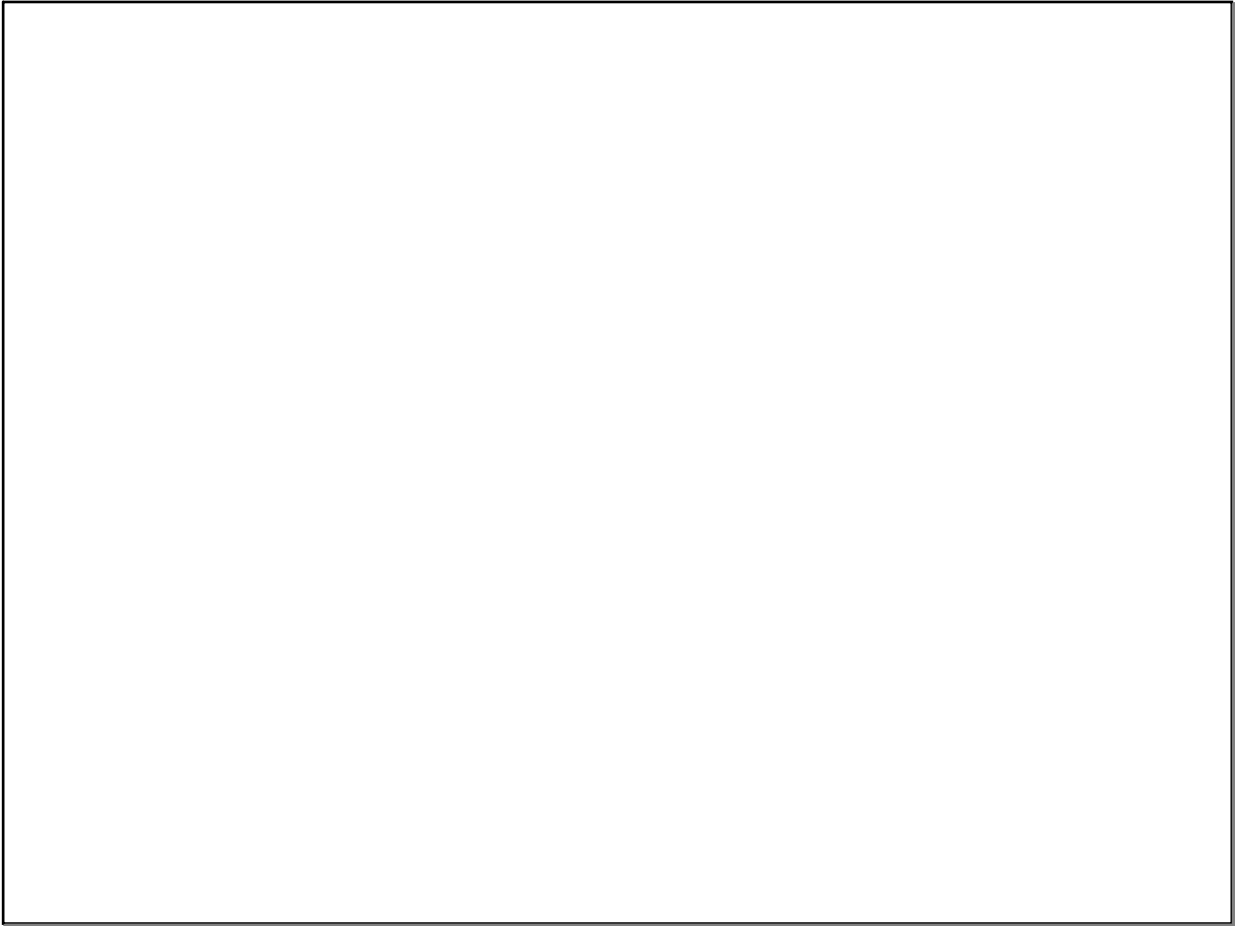
$$lram = (y_0 + y_1 + y_2 + \dots + y_{n-1}) h \quad (\text{leave off last})$$

$$rram = (y_1 + y_2 + \dots + y_{n-1} + y_n) h \quad (\text{leave off first})$$

$$\frac{lram + rram}{2} = \frac{(y_0 + 2y_1 + 2y_2 + \dots + 2y_{n-1} + y_n) h}{2}$$

$$\boxed{\text{Trap} = \frac{lram + rram}{2}}$$

Nov 30-12:25 PM



Nov 30-12:38 PM